# Consistency Management – the Expanding Rosetta Stone

Bill Schindel & Nigel Taylor

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# Overview

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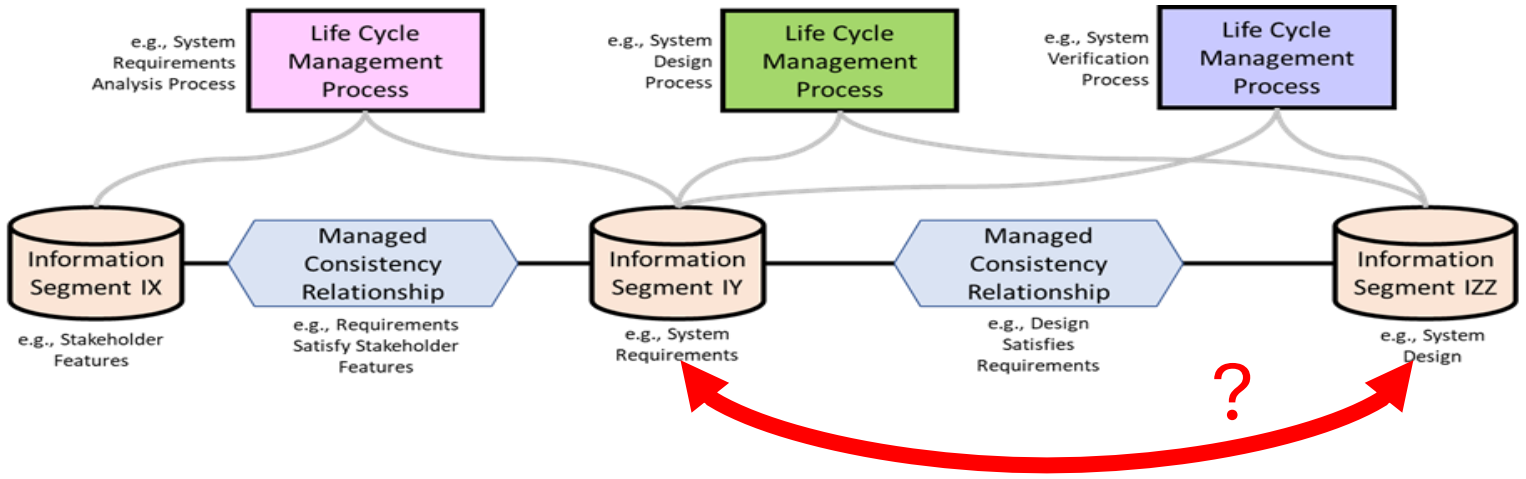
Questions, discussion

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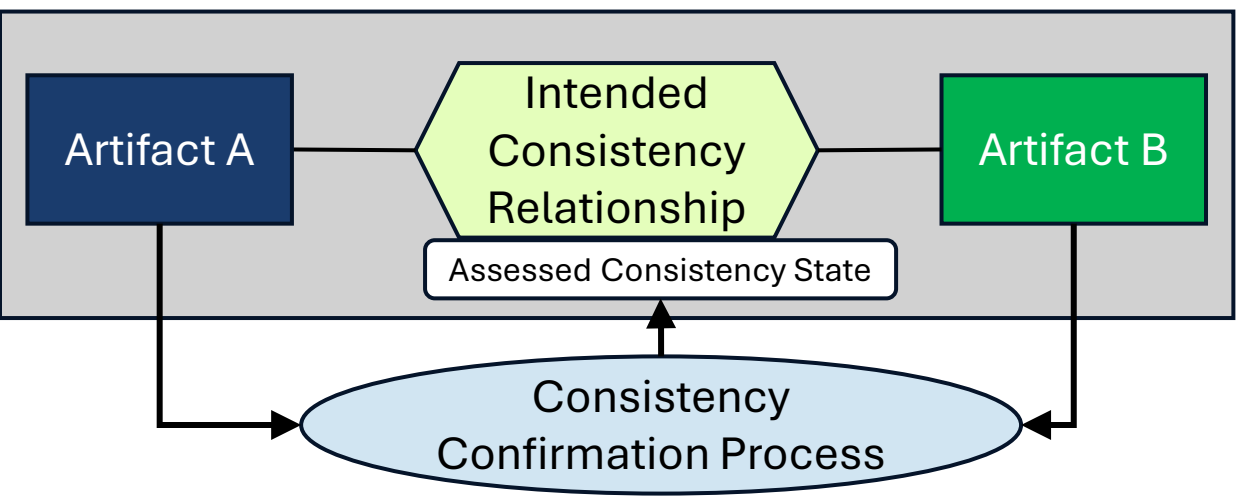
# Introduction to Consistency Management

With thanks to: Rosetta Stone Project Team

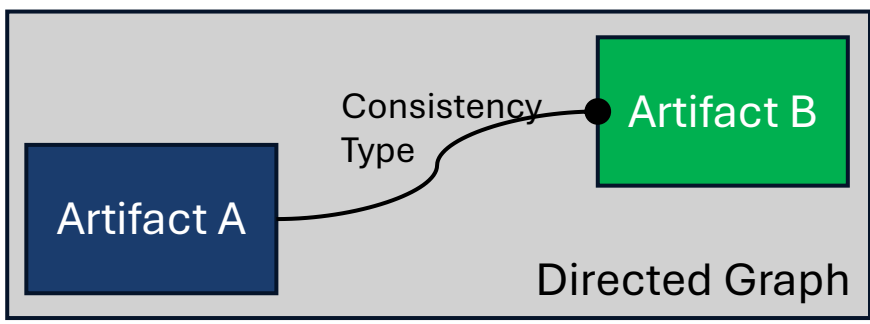
# Examples of managed consistencies, as “questions”




1. Will this system conforming to the [System Design] mean it will satisfy the [System Requirements]?
2. Does this system satisfaction of the [System Requirements] mean it will satisfy the [Stakeholder Needs]?
3. If we build this system according to the [Manufacturing Process Specification], will the result conform to the [System Design]?
4. Does this [Simulation Data] agree with the [Empirical Measurement Data]?
5. How certain are we?

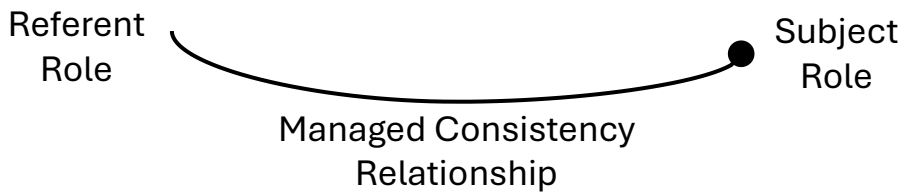


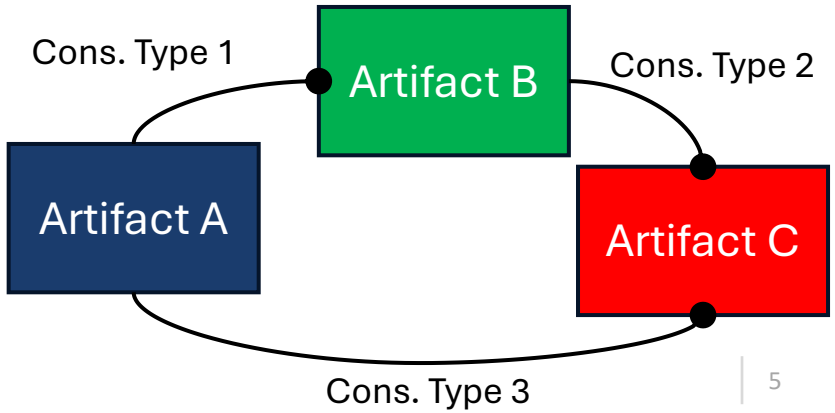

Shorthand Representation




- For any single discipline, the set of all its consistency relationship types (described by the discipline's standard practices) is a "directed graph" of pairwise *intended* consistencies:
  - The graph nodes are the compared information artifacts.
  - The graph edges (the linking lines) are the types of consistency sought (the consistency relationship, to be assessed).
  - This is not a process diagram—it is a model of desired information relationships.

- The graph links are "directed" to differentiate artifacts we are checking (the subjects) from what we are checking them against (the referents):

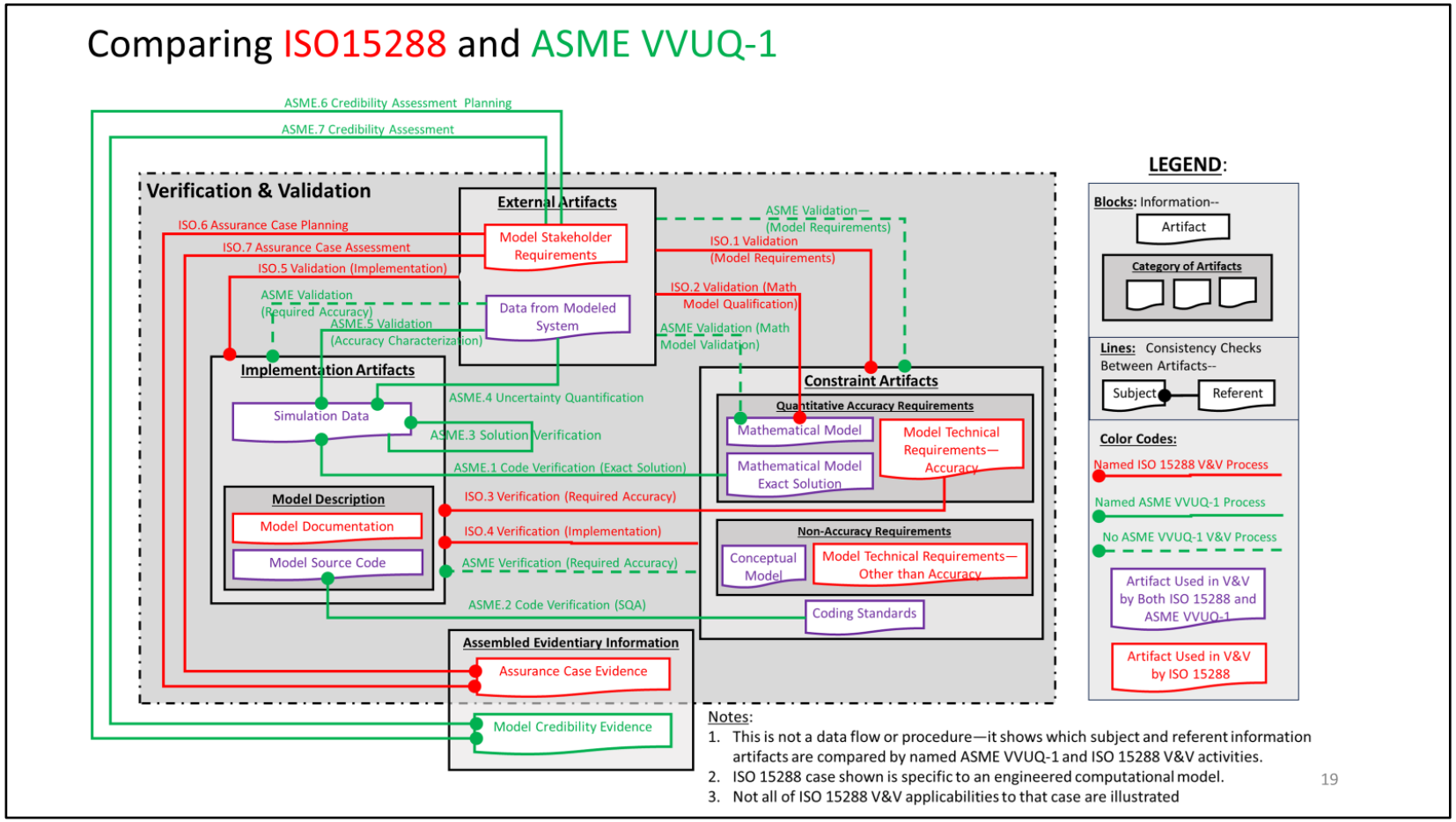


# Consistency Management: What is it?

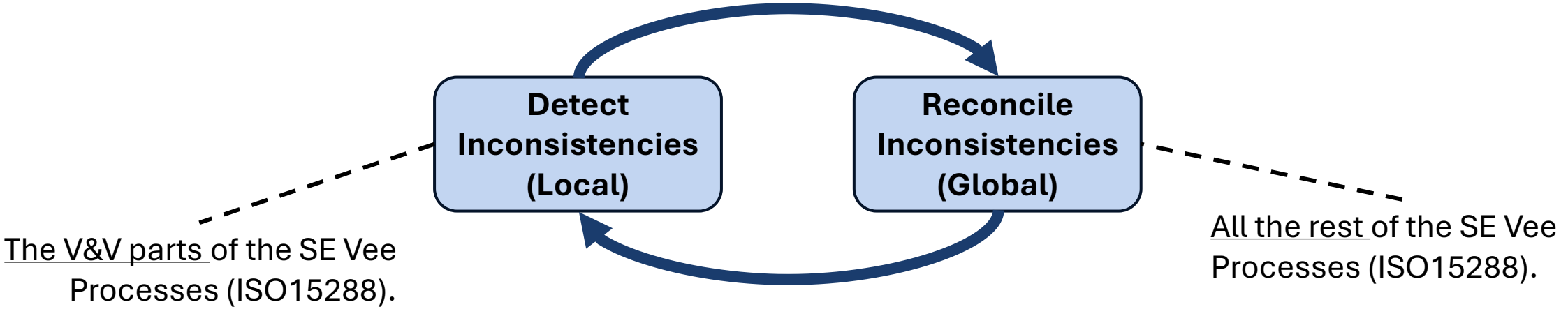
1. **Initially**: A way to understand four different societies' diverse VVUQ standards in a common way—as comparisons of consistency of information artifacts:

From the 2024 Rosetta Stone Report [1, 2]:



# Consistency Management: What is it?

2. **Subsequently**: How to understand the whole of an engineering project as a "two cycle learning engine", not limited to V&V:
   - Detect Inconsistencies (local to subject-referent artifact pairs)
   - Reconcile Inconsistencies (global across web of project's artifacts)




Inspired by: Learning algorithms, such as Back Propagation generating trajectory strategy in configuration space.



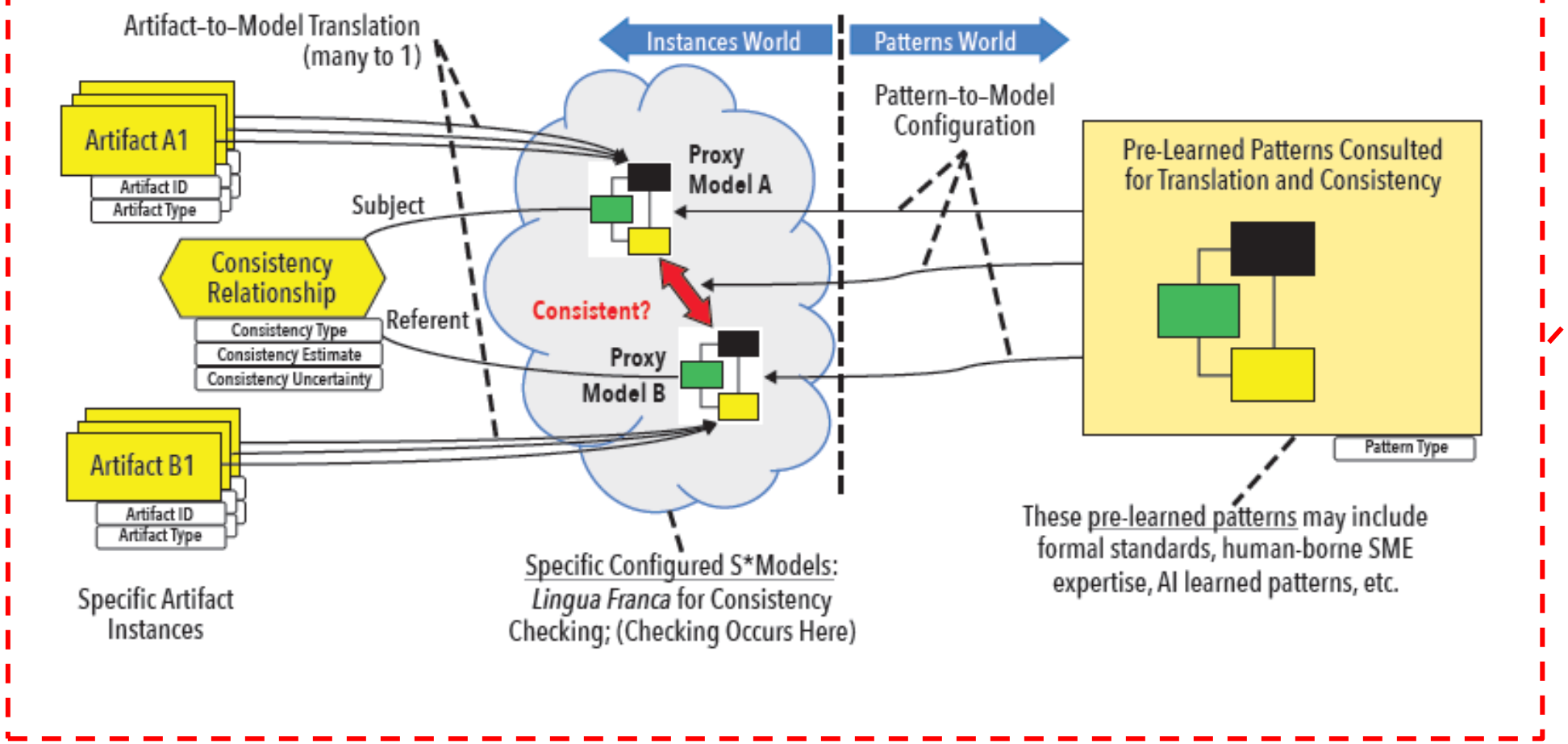
# Additional Promising Applications

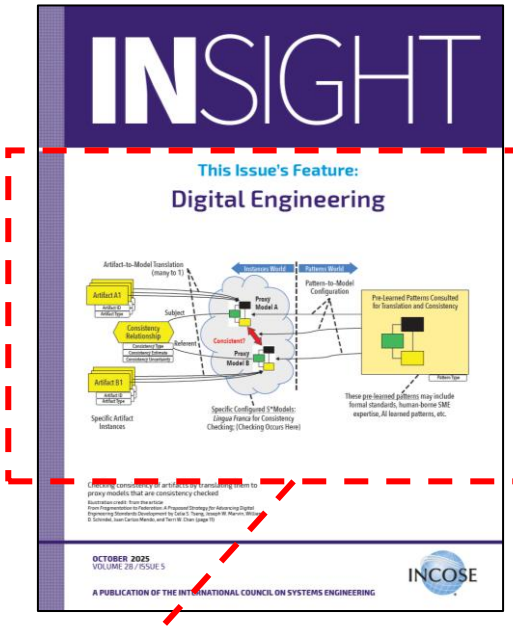
Systems Engineering (Bill)

with thanks to:

- MBSE–DE Integration Forum Team
- INCOSE Fellows

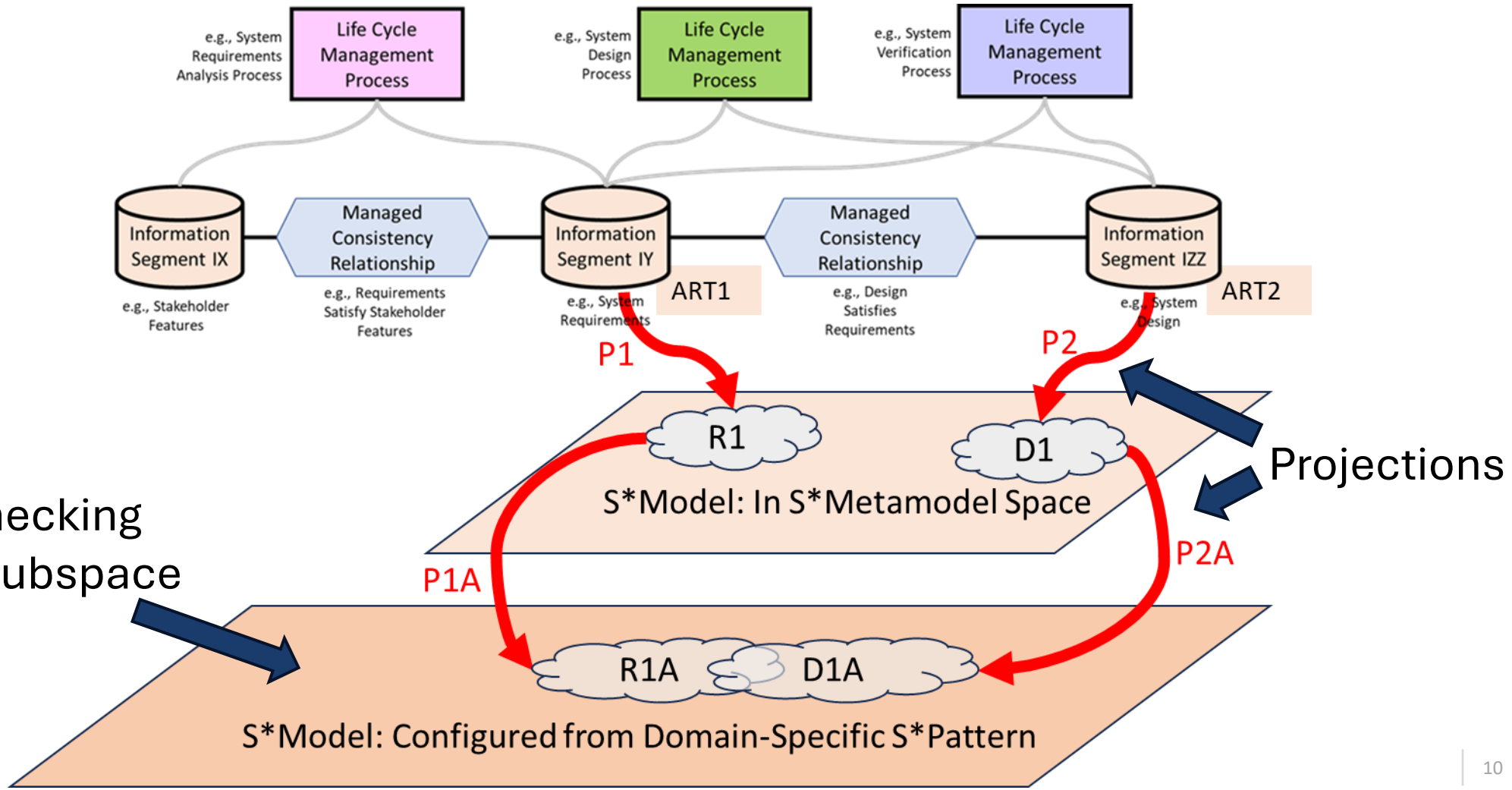
# Artifacts are translated to MBSE models, which are then compared for consistency




From INCOSE INSIGHT Special Issue on Digital Engineering, Oct, 2025 [3]

# Translation and consistency checking as projections in a vector (metric) space [4]




Consistency Checking Occurs in this Subspace

# Additional Promising Applications

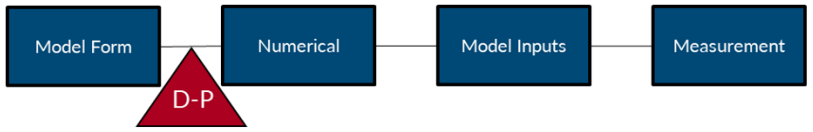
Computational Modeling (Nigel)

with thanks to: AIAA ICE TAG-1,
NATO STO RTG-390,
Smart Aerodynamic Testing (ARA, BAE Systems, MBDA UK)

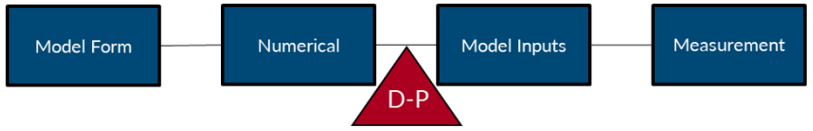
# Re-Balancing Consistency Checks for (more Integrated) Industrial Scenarios

"Model Developers"

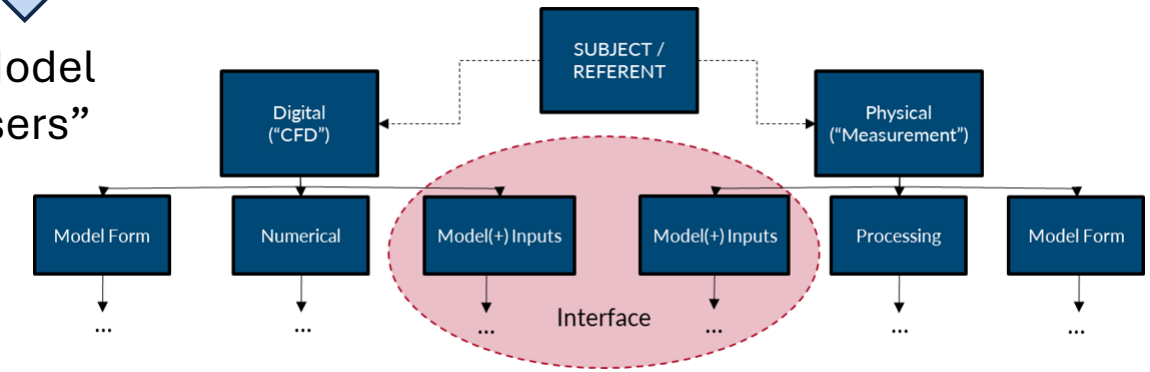
"Model Users"




Consistency checks Balanced for Model Developers [ASME VV20]



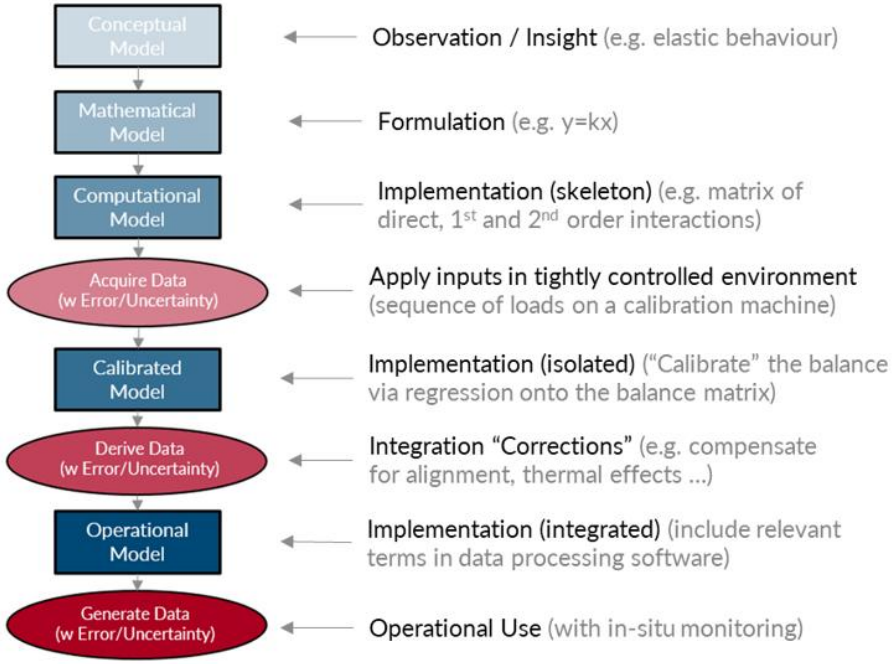

Consistency checks Balanced for Industrial Users [AIAA 2024-4242, AVT-391]




Simplified Elaboration of Subject & Referent (First Tier only)

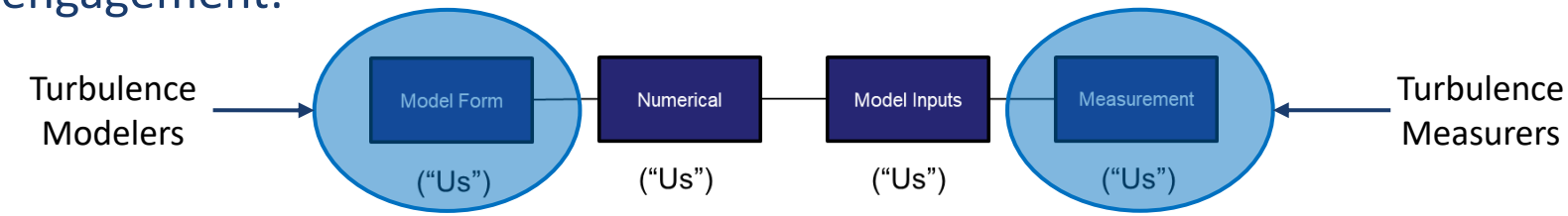
## Maintaining Consistency with other (simpler computational) models

e.g. For strain gauge balances used in wind tunnel testing



# Expanding the Scope of Consistency Checks to Address Predictions

- All Standards included in Rosetta Stone Project addressed diagnostic scenarios only (in which physical Referent data *may be* available)
- So, what about Predictions? (where physical Referent data is not yet available) Seeking broad stakeholder engagement:




**Four Special Sessions @ SciTech 2026:**

- APA-06: "Validation Dialog Between Turbulence Modelers and Turbulence Measurers" Monday 12 January, 9:30-11:30, Coral Spring IID
- GT-04/APA-24/AMT-08/FD-31/CFD2030-07: "Meet the Turbulence Modelers II", Tue. 13 January, 9:30-11:30am, Plaza Ballroom D
- GT-07/APA-39/AMT-21/FD-51/CFD2030-08: "Meet the Turbulence Measurers II", Wed. 14 January, 1:00-3:00pm, Plaza Ballroom D
- GT-15/APA-60/AMT-26/FD-72/CFD2030-09: "Turbulence Modelling and Turbulence Measuring: Shared Implication for Numerics and Uncertainty Quantification" (Panel), Thur. January 15, 9:30-11:30am, Plaza Ballroom D

# What’s Next?

DEIC participation in feedback to Standards Organizations

# Questions, discussion

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# References


1. Fischer, O., French, M., Hightower, J., Karl, A., Matlik, M., Pullum, L., Schindel, W., Shao, G., Taylor, N., "A Cross-Society Collaboration Project: Mapping Consistency Confirmation Frameworks of Different Communities". Download from -- https://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:rosetta_stone_project_report_01.08.2025_v2.1.5.pdf
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3. Tseng, C., Marvin, J., Schindel, W., Mendo, J., Chan, T., "From Fragmentation to Federation: A Proposed Strategy for Advancing Digital Engineering Standards Development", from *INCOSE INSIGHT Magazine*, October, 2025. Download from -- https://www.omgwiki.org/MBSE/lib/exe/fetch.php?media=mbse:patterns:incose_insight_excerpt_oct_2025.pdf
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